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THESIS

A MANAGEMENT STRATEGY
FOR THE
NAVAL ADMINISTRATIVE TELEPHONE SYSTEM

by

Timothy L. Edgell

March 1985

Thesis Advisor: J. LaPatra

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This thesis examines the various system and environmental factors which impact upon a selection of a management strategy, and within the constraints imposed by these factors, develops a hybrid management strategy alternative for the Navy's administrative telephones.

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A Management Strategy for the Naval Administrative Telephone System

by

Timothy L. Edgell
Lieutenant, United States Navy
B.S., Miami University, 1978

Submitted in partial fulfillment of the
requirements for the degree of

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ABSTRACT

Management responsibility for the Navy's administrative telephones is in transition from the Commander, Naval Facilities Engineering Command to the Commander, Naval Telecommunications Command. This shift of responsibility was precipitated by fundamental structural changes within the telecommunications industry, changes which produced a volatile market structure rife with competition. A new management strategy is required to deal with these changes. The development of alternative strategies for administrative telephones is prerequisite to any cost-benefit analysis which may be necessary to choose the most cost-effective strategic option for overall system planning and management.

This thesis examines the various system and environmental factors which impact upon a selection of a management strategy, and within the constraints imposed by these factors, develops a hybrid management strategy alternative for the Navy's administrative telephones.

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TABLE OF CONTENTS

I. INTRODUCTION 8
A. A PERIOD OF TRANSITION 8
B. THEORETICAL FRAMEWORK 10
1. The Closed System Approach 11
2. The Open System Approach 12

II. CLOSED SYSTEM STRATEGIC OPTIONS 16
A. COMMERCIAL ACTIVITIES PROGRAM 16
B. STRATEGIC ALTERNATIVES 19
1. The In-House Strategy 19
2. The Contract Strategy 19
3. The Hybrid Strategy 21

III. THE CLOSED SYSTEM VARIABLES 23
A. MANAGEMENT FRAMEWORK EVOLUTION 23
1. Historically Speaking 23
2. The Traditional Approach 25
3. Adapting to Change 27
4. The Transition Period 32
B. SYSTEM VARIABLES 33
1. Topography 33
2. Hardware 34
3. Personnel 35
4. Node Size 35
C. SYNOPSIS 36

IV. THE OPEN SYSTEM VARIABLES 38
A. REGULATORY 38
B. TECHNOLOGICAL 44
1. Industry-Wide 44

2. Market Niches 47
C. MONETARY 50
D. STRUCTURAL 52
E. INFORMATION SECURITY 54
F. SYNOPSIS 56

V. CLOSED SYSTEM STRATEGY 58
A. PROCEDURE SPECIFICATIONS 58
1. Node Analysis 58
2. Engineering and Design 60
3. Installation and Maintenance 61
4. Programming and Budgeting 61
5. Service Acquisition 62
6. Equipment Acquisition 63
B. SYNOPSIS 64

VI. OPEN SYSTEM APPROACH 66
A. POLICY ISSUES 66

VII. CONCLUSION 71

LIST OF REFERENCES 74

INITIAL DISTRIBUTION LIST 80

LIST OF FIGURES

1.1 Naval Telecommunications Management Structure . . . 13
4.1 Interim COMNAVTELCOM Headquarters Structure 53

I. INTRODUCTION

A. A PERIOD OF TRANSITION

The transfer of management responsibility for administrative telephones within the Department of the Navy (DON) commenced on October 1, 1984. At that time, the Commander, Naval Facilities Engineering Command (COMNAVFACENGCOM) passed policy formulation and control functions to the Commander, Naval Telecommunications Command (COMNAVTELCOM). In order to assure continuity of authority, total responsibility for Navy administrative telephones will transition gradually. This transition period is scheduled to be completed by July 1, 1985, at which time COMNAVTELCOM will assume full management responsibility. Naval administrative telephone facilities and services, as currently defined, include [Ref. 1: encl (1), pp. 1-2]:

a) Automatic or manual systems providing a Shore (Field) Activity with common user, on-base telephone service connected to a commercial telephone system through trunk lines. The telephone facilities and services may be Government-owned and/or leased, including such items as instruments and associated apparatus, and outside cable plant.
b) Other local, on-base communications systems that may use portions of the local telephone system, such as public address systems, administrative intercom systems, fire reporting systems, and alarm systems.
c) Local, on-base telephone facilities that interconnect with AUTOVON (e.g., digit 8 level dialing).
d) Foreign exchange lines
e) Off-premise extensions

f) Wide Area Telecommunications Service (WATS)

g) Teletypewriter Exchange Service (TWX) and International and Domestic Teleprinter Exchange Service (TELEX) - Commercial services permitting teletypewriter communications on the same basis as telephone service, operating through central switchboards to stations within the same city or in other cities.

This realignment of responsibility can be viewed as an effort by the Department of the Navy to react to the fundamental structural change within the telecommunications industry resulting from its evolution into a fully competitive market structure.[1] The proliferation of hardware and services in a competitive industry coupled with technological advances resulting from increased private-sector research and development (R&D) efforts further compound management problems.

The choice of COMNAVTELCOM to spearhead this new management thrust for administrative telephones was a natural one, since included in the COMNAVTELCOM mission is "the satisfaction of all tactical, administrative and logistics information transfer requirements of the Navy" [Ref. 2: p. 14]. Born from its predecessor, the Naval Communications Command, in 1972 as a result of a Chief of Naval Operations (CNO) advisory committee report, COMNAVTELCOM quickly adopted a systems approach to managing the Naval Telecommunications System (NTS).[2] Historically, the NTS had grown in a piecemeal fashion, as autonomous units outlined their specifications and requirements and submitted them for funding and implementation. This had resulted in a fragmented system plagued by slow and unreliable information handling systems.

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[1]The circumstances surrounding this competitive movement are detailed in Chapter IV.

[2]Specific management duties are detailed in References 1 and 3.

Additionally, it had produced a piecemeal approach to planning and an underutilization of system resources. The adoption of a systems approach by COMNAVTELCOM produced a more coherent, interoperable, state-of-the-art NTS. [Ref. 2: p. 164]

A similar challenge exists in the arena of administrative telephones. COMNAVTELCOM is assuming management responsibility for a varietal collection of terminal equipment, wiring, switchboards, private branch exchanges (PBXs) and private automatic branch exchanges (PABXs) (both owned and leased), and a multitude of contracts for service in support of Naval installations throughout the world. Just as with the NTS, a systems approach to management is required if a more coherent, state-of-the-art administrative telephone system is to be achieved. It is with this systems approach in mind that the term Naval Administrative Telephone System (NATS) will be used throughout this thesis to refer to the collection of hardware and services for which COMNAVTELCOM must formulate a management strategy.

B. THEORETICAL FRAMEWORK

Traditionally, when faced with complex problems such as this, organizations have resorted to a problem resolution technique embodied in the age-old adage "divide and conquer." The key premise of this technique is that if a complex (macro-) problem is divided into a set of smaller (micro-) problems, then the solution set of these micro-problems, when merged, will yield a solution to the macro-problem. This chunking technique, as Peters and Waterman termed it [Ref. 4: p. 126], was a key factor in the development of organizational design and management theory during this century. This body of theory can be grouped into two separate sets with the primary differences being the

methodology used to accomplish the chunking and the coordinating mechanisms employed to merge the micro-solutions into an answer to the macro-problem.[3]

1. The Closed System Approach

The early thrust of organizational development and management theory was based upon the concept of elementarism (i.e., viewing the total as a sum of its individual parts) [Ref. 5: pp. 376-377]. This view has been termed the closed system approach, since it treats an organization as independent of its external environment. This view was embodied in the classical approach to organizational theory espoused by theorists such as Max Weber, Henri Fayol and Frederick Taylor. The classical approach held that the most efficient and effective organizations had a hierarchical structure based upon legalized, formal authority [Ref. 6: pp. 353-355]. It was Weber who called such a formalized organizational structure a "bureaucracy".

The neoclassical approach was the next stage of the closed system theory evolution. The advocates of the neoclassical approach were Douglas McGregor (with his Theory X and Theory Y), Chris Argyris, Rensis Likert, et. al. [Ref. 6: pp. 355-359]. The neoclassicists held that the bureaucratic model of the classicists relied too heavily upon formal authority and thus stifled individuals. The neoclassicists advocated that a less formal structure which would incorporate basic human needs such as self-reliance, self-expression and accomplishment would be more efficient and effective than the bureaucratic model.

The classical and neoclassical approaches dominated management theory and practice until the 1960s. Organizations were structured along hierarchical lines, as

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[3]See Reference 4, chapter 4 for a synopsis of the evolution of this management theory.

is the Department of the Navy, and the chunking of macro-problems was accomplished through the structural overlay of the hierarchy. The coordinating mechanism used in this approach is the hierarchical structure itself and the formal authority upon which it operates. Micro-solutions are generated at the lower levels of the hierarchy and forwarded up the chain-of-command. At each higher level of the structure, micro-solutions from lower levels are fused and forwarded to the next echelon. This process then, theoretically, yields a macro-solution at the top level of the structure. This hierarchical structure for Navy telecommunications is shown in Figure 1.1.

2. The Open System Approach

In the 1960s the body of theory was enriched with the popularization of the open system approach,[4] an approach based upon a more synergistic view (i.e., that the whole is greater than the sum of its parts) [Ref. 5: p. 376]. The open system approach asserts that the organization is not independent of its environment but, in fact, the external environment is a major variable affecting both organizational structure and processes.

The open system view has been embodied in the contingency approaches to organizational design and management theory. These theories do not presuppose a single, most efficient or most effective view of structuring, as did the closed system theories, but rather the contingency approaches hold that the appropriate structure must form a fit with the organization's strategy, technology, environment, and people.

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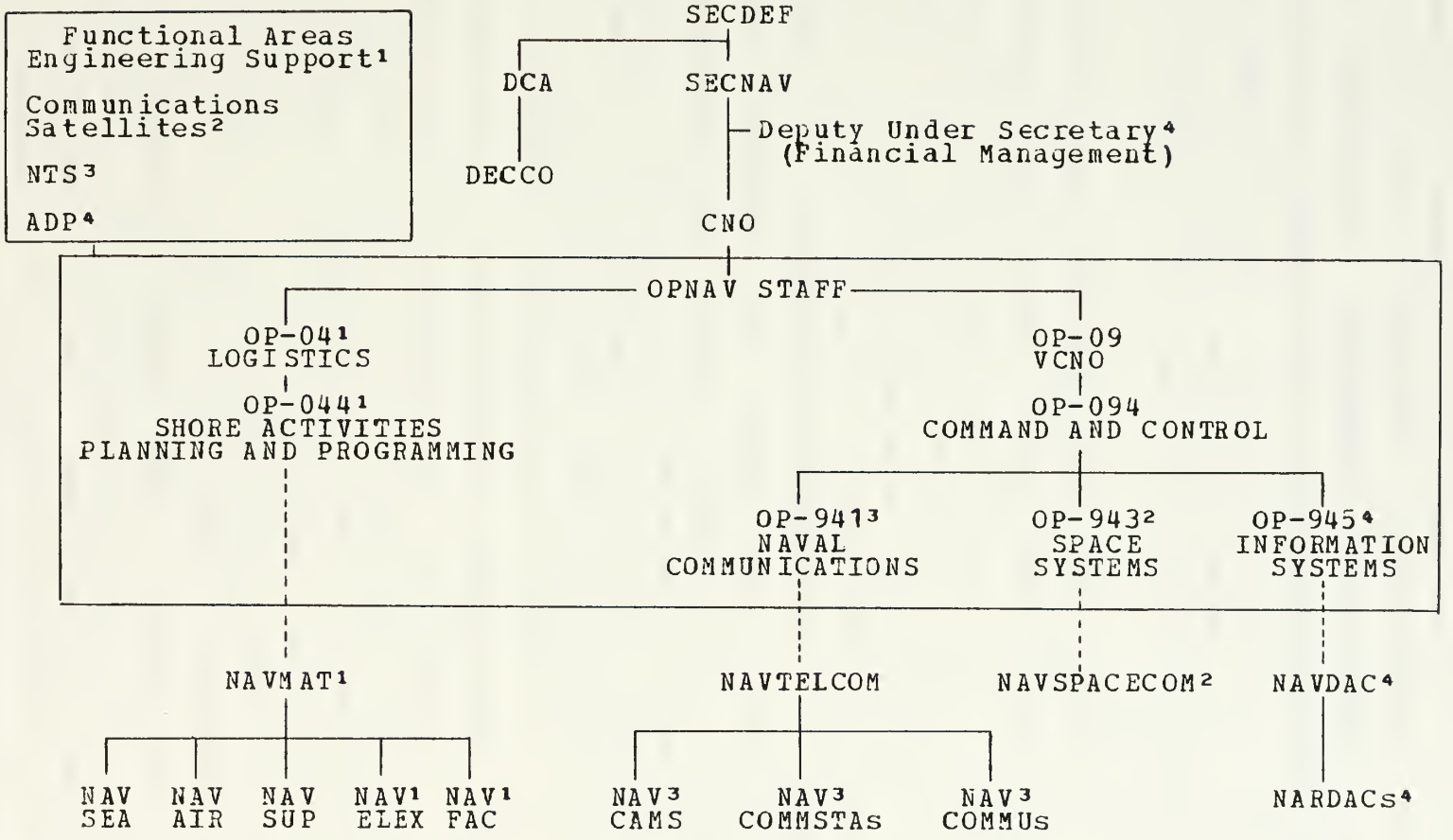
[4]Although popularized in the 1960s, this approach stemmed from General Systems Theory which was developed in the 1920s [Ref. 5: p. 375].



Source: [Ref. 7]

Figure 1.1 Naval Telecommunications Management Structure

The open systems view has given rise to scores of operations researchers, systems analysts, management scientists, et. al., who labor to model the complex interactions between strategy, environment, technology, and people. These complex interactions involve interdependency and change and as Cleland and King put it, "... the solutions to these challenges will themselves involve a significant degree of interdependence, complexity, and need to adapt to change" [Ref. 8: p. 4].

The contingency approaches have been embodied in a number of organizaticnal efforts since their popularization in the 1960s. Most notable of these efforts have been the matrix and project or program structures. The program (or project) structure has been used extensively in the Navy, most notably in the Systems Commands. The chunking of macro-problems in the contingency approaches is accomplished along functional or task lines. The coordinating mechanism is inherent in the functional or task sub-structure itself, i.e., the program management team's authority and expertise span traditional hierarchical boundaries and therefore can accomplish coordination within the sub-structure.

It is within this theoretical framework of the closed and open systems approaches that this thesis will focus. In Chapter II, the strategic options available to COMNAVTELCOM for managing the Navy's administrative telephones are presented from a closed system viewpoint. The internal variables associated with the closed system approach are presented in Chapter III. This nucleus of internal variables is augmented in Chapter IV with the addition of the external or environmental variables which are pertinent to the open system approach. The formulation of a closed system strategy based upon the identified internal variables is presented in Chapter V. The complexities associated with the development of an open system strategy are

discussed in Chapter VI. This discussion is based upon both the internal and external variables presented in Chapters III and IV. Chapter VII summarizes the analysis of the NATS management challenge and specific recommendations are included in order to focus efforts to meet the complexity of this challenge.

II. CLOSED SYSTEM STRATEGIC OPTIONS

From a closed system approach, several options are available to COMNAVTELCOM for NATS management. These options range from what is referred to as a totally in-house strategy (all management functions being performed by Naval personnel and/or DON civilian employees and all equipment and services being provided by Navy assets) to the other extreme, an all contract strategy (all management, equipment and services provided under contract by the private sector). The third alternative, a hybrid approach, is a combination of these two extremes; a strategy calling for a mix of both in-house and contract approaches.

These options are similar to those presented in the Navy Commercial Activities Program.[5] This program is based upon Office of Management and Budget (OMB) Circular A-76 and is implemented within the Navy by References 10, 11, and 12. Commercial activities are defined as those activities performed by Government or Defense Department personnel which provide a product or service that could be obtained from the private sector.

A. COMMERCIAL ACTIVITIES PROGRAM

The Commercial Activities Program embodies the general policy of relying on the private sector for goods and services while, at the same time, recognizing that certain functions may be intrinsically governmental or defense-related and therefore, must be performed in-house. The underlying principle is that when private sector performance

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[5]Although the sources cited are out of date, Reference 9 provides a good overview of the Navy's Commercial Activities Program.

is feasible, the ultimate decision will be based upon the most cost-effective method, whether private sector or in-house. In order to make the decision regarding cost-effectiveness, a cost comparison study is performed for those functions determined to be non-exempt due to governmental or defense-related reasons. [Ref. 13: pp. 41-46]

The Navy's Commercial Activities Program consists of three phases: inventory, review and cost comparison [Ref. 14: p. D-73]. During the inventory phase all shore activities identify and inventory their commercial activities. These activities are then reviewed and if defense-related or other exemption reasons cannot be identified and if the product or service is available from the private sector, then a cost comparison is initiated.

The cost comparison phase is comprised of the management study, the Performance Work Statement (PWS) and the cost analysis. The management study is conducted to ensure that the in-house approach is organized and staffed as efficiently and effectively as possible and that procedures are conducive to proper performance of services. The in-house cost estimate will be based upon the results of the management study and thus, this process serves a fundamental purpose in forcing managers to address management procedures from an efficiency and effectiveness standpoint.

The Performance Work Statement is prepared in conjunction with the management analysis in accordance with guidance contained in Federal Procurement Policy Pamphlet No. 4. The PWS is a performance oriented, concise statement of the current or anticipated governmental requirements and details the procedures to be used to determine if those requirements have been met.

The cost analysis phase consists of computing the in-house cost estimate (based upon the results of the management study and the PWS) and obtaining cost estimates

for the private sector from contractor bids received in response to solicitations (which are also based upon the PWS). These two costs are then compared and a decision made as to which alternative, the in-house or contract, is more cost effective.

One issue worthy of note with respect to this process is the predisposition for cost overruns in those cases where the private sector or contract approach has been selected. As Bob Edgell, a contracting specialist with the American Federation of Government Employees, pointed out in a recent interview, of the 235 service contracts awarded by the Defense Department during 1981 and 1982, the actual price tag for the contracts ran an average 11.4 percent over the initial cost estimates. The Navy showed the largest cost overrun (16 percent), even though Navy contracts represented only a small percentage of the total for these two years. Mr. Edgell further contended that these cost overruns were "wiping out any purported savings" from converting government jobs to the private sector. [Ref. 15]

The final and, perhaps, most significant issue to be examined is the Commercial Activities Program's reinforcement of a closed system approach to management. The program is focused at the field activity level. Although the field activities' commanding officers may consider "... results of manpower surveys, management studies, audit reports, work force/union involvement, etc., in arriving at the optimum organization" [Ref. 11: p. IV-20], they are constrained by policy and guidance from the chain-of-command, in that functional tasks, procedural specifications and reporting requirements (and report formats), etc., are established by higher authority. Since the local management effort is focused toward implementation of guidance from higher authority, the most cost-effective in-house organization and the PWS as well, will be similarly focused toward

implementation. This method is subject to the same argument as other classical or neoclassical approaches, i.e., that it will not yield an effective organization because "It does not take into account rapidly changing and uncertain environments" [Ref. 6: pp. 354-355]. It is with this issue in mind that a more global approach is adopted for developing a management strategy for the Navy administrative telephone system.

B. STRATEGIC ALTERNATIVES

1. The In-House Strategy

The Navy, unlike the Army and Air Force, maintains no resident corps of uniformed communications personnel who would reap training benefits from maintaining and operating the NATS. The lack of such a nucleus of Naval personnel precludes maintaining the NATS for any skill-sustaining reasons. This lack of trained personnel diminishes the appeal of the in-house strategy since the costs associated with organizing, training and administering such a corps to meet certain NATS requirements, such as installation and maintenance duties, would be prohibitive. Similarly, the costs of building such a corps of DON civilian employees would be such that a total in-house strategy for NATS management is not considered a viable option.

2. The Contract Strategy

This strategy is exemplified by the General Services Administration (GSA) issuance[6] of a Request for Proposal (RFP) on February 13, 1985 for private sector bids on a ten-year, $4.2 billion contract for replacing the

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[6]The standard method employed for soliciting proposals or bids from the private sector is through publication of a notice in the Commerce Business Daily.

22-year-old Federal Telecommunications System (FTS). GSA, the Federal government's contracting agent, requested proposals to establish "an all-digital network capable of transmitting voice, video and data among government offices around the country" [Ref. 16]. GSA also wants the contract to include the management of all billing and maintenance for the system. As a GSA spokesman, Bob Bushelle, was quoted as saying in an Associated Press story [Ref. 17]:

> "What the government wants is a one-stop telecommunications company, operated by a single prime contractor, that can provide and manage a total system service for 1.3 million government workers for 10 years starting in 1989."

In the same story, Frank J. Carr, Assistant GSA Administrator of Information Resources Management, was quoted, "We are not interested in setting up a government system".

This GSA action must be examined in a broader context in order to understand the strategic option it implies. In addition to performing as the Federal government's contracting agent, GSA is one of the twenty-two Federal entities which comprise the National Communications System (NCS). The NCS was created under a memorandum issued by President John F. Kennedy in 1963 as a result of communications difficulties experienced by the Executive branch during the Cuban missile crisis. [Ref. 18]

As a member of the NCS, GSA must comply with the policy principles which govern the NCS; principles promulgated in National Security Decision Directive (NSDD) number 97, signed by President Ronald Reagan in 1983. The key policy principle of NSDD-97 applicable in this instance is: "continue to place reliance on commercial or private telecommunications resources for critical government-wide telecommunications" [Ref. 19: p. 15]. Thus, in its issuance of

the RFP, GSA is choosing the contract strategy which aligns with the policy principles of NSDD-97 in addition to the general policy of reliance on the private sector promulgated in OMB Circular A-76. The implicit assumption in GSA's action is that the most cost-effective strategic option for the FTS is to contract for a 'one-stop telecommunications company'.

3. The Hybrid Strategy

In formulating a management strategy for NATS, COMNAVTELCOM does not face the policy constraints of NSDD-97, since NATS assets are not constituents of the NCS. Although the Navy Commercial Activities Program is focused upon individual field activities, the same general philosophy must apply to NATS management. Thus, COMNAVTELCOM may have greater latitude in choosing a management strategy but the choices are still constrained by the implicit mandate to perform the mission in the most cost-effective manner. Therefore, the choice of a management strategy is one of cost-benefit analysis among the various options.

In order to conduct a cost-benefit analysis of the options, detailed cost data must be developed. In the case of the contract strategy, the collection of cost data is straightforward. Sufficient data can be garnered from contractor responses to an RFP, assuming that management requirements are adequately stated in the solicitation.

The hybrid strategy, on the other hand, presents a more complex issue. In order to develop sufficient cost data to facilitate any cost-benefit analysis, a hybrid strategy must be formulated which will meet NATS management requirements. Only after this hybrid strategy is developed can accurate parameters be identified to assess management, maintenance, hardware, services and support costs. It is toward this end, the identification of management

requirements and the formulation of procedures to fulfill these requirements, that the closed system approach is focused. With the strategy formulated, it becomes only an exercise in economic analysis to develop the cost parameters of the hybrid approach for comparison with the contract strategy, with the ultimate goal of pinpointing the most cost-effective method of NATS management.

III. THE CLOSED SYSTEM VARIABLES

A. MANAGEMENT FRAMEWORK EVOLUTION

The closed system approach is naturally centered upon the system's internal environment due to the classical and neoclassical theories' postulation that the organization is independent of its external environment. In reality, it is impossible to totally segregate these internal variables, since, over time, environmental factors have influenced the internal environment. However, for presentation purposes, the closed and open system approaches will be addressed separately, with environmental influences being presented as such.

One of the key internal NATS variables is the management framework existing at the time of the shift of NATS responsibility to COMNAVTELCOM. To understand this framework, it is necessary to review some of the historical factors which influenced its evolution.

1. Historically Speaking

Management policy for administrative telephones was the product of a long and close relationship between the Navy and American Telephone and Telegraph Company (AT&T), a relationship that flourished by virtue of AT&T's status as a de facto monopolist. Not only did AT&T provide for all of the Navy's requirements in the realm of telephone equipment and service, but the Bell System played a vital role in research and development and was instrumental in many advances in Naval telecommunications [Ref. 20: pp. 21-25]:

a) 1915:

- Transatlantic radio communications were established

using a Navy antenna at Arlington, Virginia and Bell System amplifiers

- The first Naval order ever sent by radiotelephone was transmitted from Washington, D.C. to the Brooklyn Navy Yard by Josephus Daniels, Secretary of the Navy

b) 1916: The Bell System financed and conducted a national mobilization test for the Navy during which:

- All Navy yards were connected via telephone circuits to the Office of the Secretary of the Navy, simulating wartime readiness
- Bell System engineers installed radiotelephone equipment onboard the USS New Hampshire and using Navy transmitters at Arlington, Virginia and Navy receivers at Norfolk, successfully demonstrated long-distance radiotelephone communications
- Using a combination of Navy radio stations and Bell System facilities the Navy established satisfactory communications between Washington, D.C. and the Panama Canal Zone; Mare Island, California; and Honolulu, Hawaii

c) World War II:

- Bell Laboratories were involved in over two thousand military projects
- Western Electric, the Bell System manufacturing subsidiary, produced radar and gun director systems, communications equipment, sonar, magnetic mines, acoustic torpedoes and proximity fuses for the Navy

The list continues with such examples as the Automatic Voice Network (AUTOVON), which was developed and built by the Bell System. AUTOVON was the first switched military telephone network and is the world's largest private network. With such close cooperation between AT&T and the Department of the Navy and considering the industry

status of AT&T as the de facto monopolist, the management strategy adopted for administrative telephones was a natural outcome.

2. The Traditional Approach

The Secretary of the Navy (SECNAV) has assigned the responsibility for providing telecommunications service for Naval Forces to the Chief of Naval Operations [Ref. 21]. In discharging this responsibility, the CNO functions through a multileveled staff and has delegated authority for differing subsets of telecommunications services to subordinate second and third echelon commands. Figure 1.1 illustrates the hierarchical structure established within the Navy to meet the requirements of providing telecommunications service for Naval Forces.

Management responsibilities for administrative telephone services were vested in the Chief of Naval Material and his subordinate third-echelon command, the Naval Facilities Engineering Command (NAVFAC). The responsibilities assigned to the Chief of Naval Material include tasking for the review, approval and contracting for administrative telephone services and facilities. Responsibilities enumerated include [Ref. 1: p. 4]:

a) Validating requirements and approving changes to existing telephone systems and ownership
b) Establishing standards and procedures for the management of administrative telephone service
c) Executing contracts for telephone systems and services in accordance with current Navy procurement directives
d) Reviewing currently published standards and procedures, including technical requirements for interface with AUTOVON, for operation and maintenance of administrative telephone facilities and services and to promulgate changes as necessary to ensure maintenance

of quality levels equivalent to good commercial practices.

The basic Naval Material Command (NAVMAT) and NAVFAC management policies for administrative telephones are contained in References 22 and 23. The procedures employed were basically user initiated in that all leased or purchased services and equipment were procured upon request of the user.

At the local level, the base telephone manager, normally a member of the Public Works Center (PWC) organization, received user requests and in accordance with NAVFAC established procedures, obtained the required service and/or equipment by contacting either the local Bell operating company (BOC), the independent operating company (IOC) or the AT&T representative and satisfying the requirement using a standard communications services authorization (CSA). The CSA obligated funds against a standing contract which either NAVFAC or the Defense Commercial Communications Office (DECCO)[7] had previously negotiated. Either the BOC/IOC or AT&T would then perform all necessary coordination needed to implement the request. This method was authorized for all acquisitions below a one-thousand-dollar threshold and since most user requests fell below threshold, it proved responsive to requirements. [Ref. 20: p. 70]

The procurement of services and/or equipment above the one-thousand-dollar threshold required that the base telephone manager forward the CSA to the next echelon, the regional field division of the Naval Facilities Engineering Command. The regional division, of which there are six, would contact AT&T who would research the requirement and

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[7]DECCO, an arm of the Defense Communications Agency (DCA), is tasked with all contracting functions for long-line services throughout DOD just as GSA performs similar contracting functions for the remainder of the Federal Government.

advise the field division whether it would be cheaper to go to the local phone company for connectivity with the long distance carrier's switch, or whether it would be cheaper for DECCO (located at Scott Air Force Base, Illinois) to procure the service via a general contract. WATS services and long distance services other than direct dial, common carrier were obtained via the same procedures.

Thus, for most telephone requirements, the base telephone manager used the CSA, based on the general standing contracts which the Engineering Commands or DECCO had previously arranged. It is important to note AT&T's degree of management involvement in the total process. AT&T researched the feasibility and cost of providing user service and recommended the proper avenue to meet the user requirement. AT&T contracts provided not only service but also maintenance, end-to-end connectivity, installation, and the management to coordinate these efforts.

3. Adapting to Change

Increased industry competition produced changes in the management policy for telephone equipment. The most significant of these changes was instituted by a policy letter originated by DECCO in 1981 [Ref. 24], as a result of increasing equipment competition within the industry after the Federal Communications Commission (FCC) Computer Inquiry II Decision. Due to its significance as an initial Defense Department response to increased competition within a segment of the telecommunications industry, the provisions of the DECCO letter are presented in detail [Ref. 20: pp. 72-75]:

a) All new, deregulated customer premises equipment (CPE) is, by definition, eligible for competition in the absence of specific sole source justification to the contrary

b) Embedded equipment and equipment in the telephone companies' inventories as of December 31, 1982, can be offered under tariff until all CPE is deregulated

c) All major CPE used to provide enhanced service is now to be considered eligible for competition and the appropriate procedures for securing competition stated in the Defense Acquisition Regulations (DAR)[8] must be followed

d) For requirements which will result in a total obligation greater than ten thousand dollars, unless detailed justification can be provided explaining why only a sole source can provide the equipment or service, the customer must submit a performance work statement with the telecommunications service request (TSR)[9] in order that DECCO can properly summarize the requirement for publication in the Commerce Business Daily and issue a formal solicitation to industry

e) While the customer may feel less than qualified to write a DAR performance work statement, DECCO considers it the key to good acquisition action. It is the base upon which proposals are developed and offered, negotiations conducted, the contract awarded, and criteria set by which the government can determine if stated requirements will be met. A poorly written performance work statement can mean disaster for the customer and many headaches for the contracting officer.

Decco suggested five functions which are satisfied by the performance work statement:

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[8] Superceded by the Federal Acquisition Regulations (FAR) on 1 April, 1984.

[9] The format and submission procedures for the TSR are prescribed in reference 25.

1. It communicates to industry what is required to be responsive to the solicitation
2. It serves as the basis for the technical evaluation of alternative solutions offered by industry to meet stated requirements
3. It serves as the foundation for either accepting or rejecting delivered supplies or service
4. It serves as the basis on which to determine if equipment performs correctly once in service
5. It defines what the government should be getting for what it is spending.

The DECCO letter offered the following guidelines to supplement the DAR instructions for preparation of these performance work statements:

a) The performance work statement should be written in clear, unambiguous terms. Verbiage should be critiqued for meaning prior to inclusion. If a particular description is unclear, it should be rewritten until there can only be one reasonable interpretation by all parties

b) A middle-of-the-road attitude must be taken with regard to flexibility. If the performance work statement is too broad the contractor may deliver a product that does not satisfy the customer's needs, but the government may be forced to accept it. Conversely, rigid, restrictive parameters inhibit a contractor's creativity and innovative effort, restrict competition, and may result in sustainable protests

c) The performance work statement should be written in conventional language to the extent possible without sacrificing the technical specifics needed to define performance parameters. Frequently, diagrams or schematics which illustrate how and where desired equipment will operate and with what it must interface are helpful

d) Properly dated and pertinent reference documents should be attached to the performance work statement, or a statement included to advise where such documents can be obtained

e) The user should determine if military or federal specifications are applicable and available

f) General and background information should be clearly separated from directions and contractor responsibilities

g) The period of performance or delivery schedule should be accurately specified in terms of dates or elapsed time

h) Proper quantities must be shown

i) The user should determine if the equipment will produce results consistent with project objectives.

The user, when acquiring major competitive CPE, must also furnish DECCO with a technical evaluation plan tailored to the performance work statement to include the following:

a) The basis for award, i.e., the framework within which the government intends to evaluate proposals and award a contract

b) A list of evaluation criteria (factors and subfactors) and their relative order of importance

c) A narrative description of what the government expects to review within the factors and subfactors

d) Identification of any factor or subfactor of such a critical importance that an unsatisfactory rating could render a proposal technically nonresponsive

e) Information to offerers on the format and content of offers or proposals needed for evaluation

f) Information for the contracting officer such as technical evaluation techniques, rationale for evaluation factors, and specific weights (if any) to be assigned to the factors and subfactors

g) Anticipated system or equipment service life

h) Information as to whether or not a purchase option is desired and how it will be evaluated.

The major change initiated by this letter was the implementation of a fully competitive acquisition policy with respect to telecommunications equipment. No longer would sole source procurement from AT&T be the norm. Instead, all telecommunications equipment was to be procured in accordance with the appropriate competitive procurement procedures specified in the DAR.

The second major provision of the DECCO letter was the requirement that for any equipment procurement in excess of ten thousand dollars, the requesting activity had to submit to DECCO a performance work statement (as detailed in the DAR), along with a technical evaluation plan tailored to the performance work statement, so that DECCO could summarize the requirement for publication of the solicitation for bids in the Commerce Business Daily.

This initial DOD reaction to the changing face of the telecommunications industry followed the spirit of the Carlucci initiatives,[10] in that it required fully competitive equipment procurement. More significantly, the DECCO response placed the burden of writing performance work statements and technical evaluation plans upon the originator of the request (in most cases the base telephone manager). This approach was similar to that of the Commercial Activities Program, with the exception that no management study was mandated. Thus, the formulation of the PWS, which, under the Commercial Activities Program, is considered "... a time-consuming process requiring a

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[10]Former Deputy Secretary of Defense Frank C. Carlucci initiated a wide range of changes within DOD acquisition programs in 1981. These changes, commonly referred to as the "Carlucci initiatives" formed the basis of the DOD Acquisition Improvement Program. Reference 26 contains a detailed analysis of these changes.

considerable level of expertise in the functional area under consideration as well as the various aspects of the contracting process" [Ref. 11: p. IV-19], was left to the local telephone manager.

In summary, the need to react to a changing environment was recognized but the procedure initiated to satisfy this need left the local telephone manager only limited options, among them: to try to develop an accurate PWS and technical evaluation plan (which, if feasible, could take a year or longer to accomplish), or to contract for private sector consulting services to develop the PWS and technical evaluation plan (which could cost as much, or more, than the needed equipment). Again, this demonstrates the difficulty of the closed system to react to rapidly changing environments.

4. The Transition Period

According to preliminary information, the basic acquisition policy will remain unchanged during the transition period [Ref. 27]. The one thousand dollar threshold for local procurement will remain in effect. However, for long-line services (those circuits beyond fifty miles) all requests will be submitted to DECCO via COMNAVTELCOM. Additionally, regional one-year installation and maintenance contracts (with two, one-year renewal options) have been competitively awarded by all six of the regional NAVFAC field divisions to cover all local installation and maintenance requirements. Thus the transition procedures will retain the local threshold but installation and maintenance contracting is centralized at the regional level and DECCO will perform the contracting for all long-line services.

B. SYSTEM VARIABLES

1. Topography

The Navy Administrative Telephone System services some 162 major bases and activities throughout the world [Ref. 28]. In addition to these major installations, telephone service is essential to hundreds of Recruiting Stations, Reserve Centers, depots and small independent facilities in metropolitan areas and rural settings throughout the United States. From this perspective, NATS can be viewed as a collection of independent nodes of varying size located throughout the world, each requiring connectivity with commercial, Defense, Federal and national networks.

Node size and location are both determinants of local NATS requirements and service availability. Requirements are directly proportional to node size, i.e. major installations' traffic volumes and customer-base size necessitate switching capability, whereas small recruiting offices may require nothing more than a single-line telephone instrument. Service availability is a function of node location. In the continental United States a wide variety of services are available from commercial vendors. In addition to trunk line connections to local exchanges for accessing the public switched network (PSN), a variety of specialized common carrier (SCC)[11] services are available as well. In Alaska and Hawaii, as well as some U.S. Territories, the availability of SCC services is somewhat more limited but SCC services still present viable options for connectivity to commercial networks.

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[11]Often referred to as other common carriers (OCCs), as in 'other than AT&T'.

NATS nodes situated overseas face different connectivity issues. Access to SCC-type services, in most instances, is unavailable. The quality and reliability of commercial service varies from country to country but, in most cases, is inferior to what is considered the norm in the U.S. Additional considerations arise from the multitude of host nation agreements negotiated with the governments in the countries where NATS nodes are situated. These are some of the factors which have influenced a greater dependency upon Defense Communications System (DCS) services, such as AUTOVON, to provide connectivity for overseas NATS nodes.

The final aspect which must be addressed is node stability. The majority of NATS nodes are fixed installations and can be considered stable except for the infrequent occurrence of base closures or more infrequent openings. However, a small percentage of the nodes, primarily those of small recruiting offices, etc., are unstable, in that relocation is commonplace, as these offices react to demographic shifts.

2. Hardware

The NATS hardware base is comprised of 385 switchboards or consoles servicing some 320,000 instruments. Approximately 87 percent of the switches and consoles are analog devices. At major installations, 88 percent (142 of the 162) of the switchboards or consoles are leased. The predominant characteristic of the hardware base is its age. Most of the plant is of World War II vintage (1940-1950) and in desperate need of modernization. The same is true of the cable plant and cable support structures. [Ref. 28]

The other aspect of the hardware base (or imbedded CPE) which warrants discussion is the status of the cable plant itself. As discussed in the Regulatory section which follows, embedded CPE went to AT&T ownership as part of the

divestiture agreement, while intrasystem wiring became a BOC asset. Thus, embedded CPE issues are subject to AT&T policy while cable plant issues are subject to twenty-two different policies established by the BOCs.

3. Personnel

At the installation level, local telephone management personnel have functioned within the PWC organizations and have dealt with NATS management as with other utility services. Due to past reliance upon the Bell System, these personnel are basically unskilled in the multiplicity of tasks involved in telephone system management. This lack of experience is even more evident at small installations which have traditionally been totally reliant upon AT&T.

At higher levels of the NATS management hierarchy this same dependency upon AT&T has resulted in a dearth of expertise in the areas of system planning, design, engineering and inspection (functions traditionally provided by AT&T) [Ref. 28]. Although personnel at the higher echelons are more familiar with the industry as a result of dealing with hardware and services leases and contracts, it is evident that the current lack of expertise in non-contracting areas is noteworthy.

4. Node Size

NATS requirements derive from the inherent support mission of the system and thus are nodal in nature. Requirements at each node stem from the mission and scope of that installation. Requirements can be categorized as internal and external. Internal requirements are established by tenants at the node. User requirements such as number and type of terminal equipment (which dictates the scope of the cable plant and switching requirements) are functions of the geographic and demographic features of the

local installation. Thus, a low population density, widely dispersed at an installation would dictate different requirements than a geographically concentrated, heavily populated site.

External requirements flow directly from the internal requirements. From a supporting-role view, the size and type of trunk line connections to the local exchange as well as SCC access lines into the PSN and trunk line access to DCS and NCS networks, such as AUTOVON and FTS, respectively, are directly attributable to the nature and scope of on-base requirements, i.e. the number of terminals, size of cable plant and traffic volume required at the installation level.

Thus, the size of the individual NATS node is totally dictated by the level of administrative telephone support required at the installation. Equipment, cable plant and trunk line requirements at each node have been established over time as a function of user requests. As bases or activities have expanded and user requirements have increased, local nodes have expanded in a discrete fashion, i.e., the number of terminals and the supporting cable plant has expanded to the point of saturating local switching capacity, at which time excess demand would dictate major expansion of switching capabilities. Just as each activity's growth rate has varied, so too, has the size of NATS nodes.

C. SYNOPSIS

This chapter has outlined the traditional approach to NATS management and discussed the internal variables which are significant to the closed system approach. From this discussion it follows that NATS management must fulfill the traditional responsibilities of validating requirements and

approving changes; establishing maintenance and management standards and procedures; and contract execution functions. In meeting these responsibilities, the system variables must be incorporated. A management strategy must consider node size variations, location factors, personnel training levels, and modernization requirements dictated by an aging hardware base. This represents a complex task for the closed system approach.

IV. THE OPEN SYSTEM VARIABLES

The open system approach asserts that the organization is not independent of its environment but that, indeed, the environment is a major influence upon the organization. It is therefore necessary to examine the major environmental variables active in the telecommunications arena.

A. REGULATORY

The January 8, 1982 announcement of a settlement in the antitrust lawsuit filed against AT&T by the Justice Department on November 20, 1974, marked the end of the Bell System as it had come to be known. This action, commonly referred to as 'deregulation' should more accurately be called 'divestiture', since one of the main provisions of the settlement agreement was AT&T's divestiture of the twenty-two Bell operating companies (BOCs). Indeed, deregulation is a misnomer, since as one analyst put it, "Ironically, competitive entry is creating the need for additional regulatory responses, mainly to facilitate the competitive market structure..." [Ref. 29]. The Comptroller General, addressing the impact of equipment competition, detailed this need for increased regulation in his 1981 report to Congress: "Due to rapid technological change, the domestic common carrier telecommunications industry is in transition from a highly monopolized structure to a more competitive one. Reacting to this technological change, the Federal Communications Commission, supported by the courts, has issued a series of decisions allowing competition. This, however, has created a need for the Commission to expand its regulatory approach to assure fair competition" [Ref. 30].

Although the divestiture, in and of itself, is significant in that it marked the breakup of one of the world's largest corporations, it is more significant when put into the context of thirty years of regulatory forces which spurred competition within the industry.

The principal regulatory agency of the telephone industry is the Federal Communications Commission which was created by the Communications Act of 1934. The FCC's license is derived from a 'public interest' standard embodied in Title I of the 1934 Act [Ref. 31: p. v]. The other main agent for regulatory control is the Justice Department (DOJ), whose powers stem from application of antitrust laws.

Initially, the regulatory environment was relatively quiet. However, this fifteen year lull following the creation of the FCC was but the calm before the storm. In 1949, antitrust litigation was filed by the DOJ against AT&T, signalling the onslaught of regulatory attacks upon the traditional view of the industry as a natural monopoly. In 1956 two key regulatory actions further exemplified this regulatory trend. The first of these actions was the Consent Agreement between the Justice Department and AT&T in settlement of the antitrust litigation initiated in 1949. The agreement limited AT&T and Western Electric (AT&T's equipment manufacturing subsidiary) to conducting business solely in the regulated telecommunications arena. This consent decree would later form the basis of the 1982 'divestiture' agreement between the Justice Department and AT&T. The second 1956 action involved the Hush-a-Phone Company's attempt to market an attachment to telephone handsets which reduced background noise levels. The FCC ruled that no attachments could be made to Bell System equipment except by AT&T due to the hazard of potential damage to the system. This ruling, however, was overturned by the Court

of Appeals [Ref. 32] and thus, marked the beginning of competition in the equipment market.

Three years later the FCC issued its first major ruling against AT&T in its Above 890 Decision, which permitted the construction of private microwave networks using frequencies above 890 Megahertz (Mhz). Although these private networks could not interconnect with the Bell System, they did represent direct competition for AT&T. This 1959 FCC position that "...extended eligibility will afford a competitive spur to the manufacturing of equipment and in the development of the communications art" [Ref. 33: p. 81] established a policy that the FCC would pursue for the next twenty-five years; a policy of increasing competition within the industry for the good of the 'public interest'.

Key regulatory actions of this pre-divestiture period serve to more clearly delineate the pro-competition trend:

a) 1965 - First Computer Inquiry
   The FCC concluded that the existing telephone communications capabilities could not support the rapidly expanding needs of computer users. Therefore, special private line capabilities were needed for many data communications applications. [Ref. 20: p. 50]

b) 1968 - Carterfone Decision
   The FCC ruled that "AT&T could not unreasonably prohibit the connection of terminal equipment manufactured by AT&T's competitors to the telephone system" [Ref. 34: p. 2]. This ruling's importance lies in the fact that it permitted non-telephone equipment interconnection with the Bell network, since the Carterfone was a terminal connector for mobile radios.

c) 1971- Specialized Common Carrier (SCC) Decision
   The FCC ruled that private line, inter-city common carriers could interconnect with the local Bell System exchanges. [Ref. 20: p. 28]

d) 1981 - Computer Inquiry II Decision[12]

The FCC ruled that all telecommunications equipment, including telephones and computer-augmented communications services, would be sold on a competitive, unregulated basis. This left basically only telephone transmission services under the fully regulated category. [Ref. 20: p. 51]

In 1982 Congress, recognizing the Federal Communications Commission's new role as a catalyst of change, passed legislation adding a new section (Section 7) to the Communications Act of 1934. As the Defense Commissioner of the FCC, Mimi Weyforth Dawson, interpreted this Congressional action, Section 7 provided an explicit mandate for the Commission to "... promote growth and innovation, to get new services on-line and to bring their benefits to the American people" [Ref. 35].

The 1982 Consent Agreement was, in actuality, a Modification of Final Judgement (MFJ) in Civil Action 17-49, United States v Western Electric Co., Inc., et al. This suit, originally filed by the Justice Department in 1949, had been settled by Consent Agreement with AT&T in 1956, as previously discussed. On November 20, 1974 the Justice Department again filed suit against AT&T for alleged violations of antitrust laws. Again, this suit was settled by Consent Agreement, however, as part of the settlement, AT&T won relief from most of the provisions of the 1956 agreement. Therefore, the final judgement of that 1956 Consent Agreement had to be modified. Specific aspects of the MFJ were as follows [Ref. 31: pp. 22-23]:

1. The twenty-two Bell operating companies (BOCs) in which AT&T had majority ownership were divested from AT&T in a spin-off

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[12]A series of decisions issued in April and December, 1980, and October 1981.

2. The license contract agreements between AT&T and the BOCs were terminated
3. The standard supplies contracts between the BOCs and the Western Electric Company were terminated
4. A central point of government contact for all BOCs on National Security/Emergency Preparedness was required and BOCs can provide emergency telephone service
5. BOCs can provide only local distribution telecommunications service
6. AT&T assumed control and ownership of all interexchange facilities and services
7. AT&T can own and provide customer premises equipment (CPE) on an unregulated competitive basis
8. The 1956 Consent Decree was replaced in its entirety
9. AT&T was to provide a reorganization plan for Justice Department approval within six months from the date of the court order
10. The BOCs can order, on a priority basis, from AT&T, the Western Electric Company and the Bell Telephone Laboratories, research and development, manufactured and supporting services until September 1, 1987
11. The agreement recognized each BOC as a local distribution monopoly
12. BOCs could be consolidated or remain apart.

In accordance with these provisions, a reorganization plan was approved which created seven, separate local exchange or regional holding companies, each comprised of one or more of the twenty-two BOCs. Each of these seven local exchange companies consists of local access and transport areas (LATAs) of which there are 161 nationwide. All calls between LATAs are required to be routed through the long distance carriers.

The final regulatory note in the divestiture agreement aimed at ensuring fair competition was the requirement that

by the end of 1986, the BOCs were to provide equal access to the local switching facilities. AT&T already enjoyed hard-wired connections to the local switches which permitted accessing AT&T long distance services by simply dialing a single digit. The divestiture agreement mandated that other common carriers should be provided connections equal to those of AT&T [Ref. 36]. Although the equal access program got off to a slow start in 1984 with only 830 local exchanges being brought into conformity, it is estimated that half of the local exchanges (approximately 5,000) in the U.S. will be converted during 1985, with the remainder being converted ahead of the 1986 deadline [Ref. 37].

Thus, AT&T was divested of any local telephone operations but did maintain its entire inter-city network which provides both interstate and intrastate long distance service; its equipment, both telephones and switchboards,[13] its Western Electric manufacturing subsidiary; Bell Telephone Laboratories, its research subsidiary; and its International Division [Ref. 20: p. 58]. In other words, AT&T became just another long distance supplier in the competitive inter-exchange carrier (IXC) market, albeit by far the largest, and just another equipment supplier in the competitive customer premises equipment (CPE) market while the BOCs and IOCs, functioning as local distribution monopolies, must deal with competitors on both the input (CPE and enhanced services) side and on the output (IXC) side of each local exchange.

At the present time, except for the local operating companies (which are sanctioned local distribution monopolies), full competition permeates every aspect of the telecommunications market. In keeping with the Carlucci

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[13]These include class 1 (the twelve largest regional switchboards) through class 4 (the second smallest class of switchboards in a telephone network).

initiatives, competitive procurement procedures must be used throughout the administrative telephone system in order to maximize the purchasing power of the communications dollar.

B. TECHNOLOGICAL

1. Industry-Wide

The shift to a competitive market structure within the telecommunications industry has cleared the way for the inevitable merger of computer and telecommunications technologies. The rush of new entrants into this combined market during 1984 alone serves to demonstrate that not only is this merger inevitable, but that it may portend even more sophisticated technologies for the future.

The unregulated umbrella organization for AT&T Information Systems and Bell Laboratories (AT&T Technologies Inc.) announced the introduction of the Safari Series of microcomputers, the 3B Series of minicomputers, the Information Systems Network (ISN) and substantial enhancements to the System 85 PBX during 1984. The AT&T Technologies Inc. announcement of a planned $2.5 billion investment in System 85 enhancements over the next five years along with the introduction of the ISN local area network (LAN) indicate a significant move by the parent AT&T organization into the office automation arena. [Ref. 38]

During 1984, fourteen of the twenty-two BOCs filed waiver requests with the FCC for exemption from the provisions of the Computer Inquiry II Decision. The BOCs requested permission to provide enhanced services such as packet switching and protocol conversion as part of the BOC basic network service. Although no decision was rendered by the FCC on the request, initial indications are that the request will be favorably endorsed by the Commission. [Refs. 38,39]

In October, the North American Telecommunications Association, a group of over 600 telephone equipment manufacturers, lodged a complaint with the FCC against the BOCs. The association charged that the BOC expansion of Centrex (Central Exchange) services to include stored-program-control (call forwarding, call waiting, etc.) and interactive computer services was an abuse of the BOC local service monopoly status. The BOC counter to this charge was that they could not effectively compete in the marketplace and retain current Centrex customers without enhancing the Centrex offerings. The Centrex customers that the BOCs are worried about losing include over two-thirds of the nation's 100 largest companies. [Ref. 40]

1984 saw ITT Corporation, the world's largest conglomerate, announce its move into the U.S. telecommunications equipment market (which represents more than one-third of the worldwide market). Chairman Rand V. Araskog's plans for ITT envision adapting its vaunted System 12 European switching technology to the U.S. market and capitalizing on its advanced technology to develop a host of office automation equipment. In Araskog's view, "... the U.S. telecommunications market is up for grabs since the Bell System breakup." [Ref. 41]

In September, IBM's $2.25 billion takeover of Rolm Corporation, an industry leader in digital PBXs,[14] heralded the computer giant's foray into the office automation jungle. Even before the takeover, Rolm had foreseen the technology merging and had anticipated realizing as much as half of its future revenues from a series of PBX add-on

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[14]The PBX is widely acclaimed as the business communications hub of the future, providing interconnectivity for telephones, computers, printers and other office equipment using its telephone lines. In recent usage, the terms PABX and PBX are used interchangeably since, from an industry standpoint, all modern private branch exchanges are automatic.

features such as electronic mail and desktop workstations. The IBM-Rolm effort will undoubtedly have a significant impact upon the industry. As Robert C. Fleming, an analyst with Gartner Group Inc. (an IBM-watcher), states, "Strategically, IBM sees voice and data in a single box as its future, too, and eventually will want control of all the pieces...." [Refs. 42,43]

Northern Telecom Ltd., the Canadian telecommunications equipment manufacturer, saw its 1984 sales of PBXs increase approximately 30 percent over its 15.7 percent market share for 1983. The U.S. Integrated Office Systems Division of Northern introduced four new models of its staple SL-1 PBX during the year and the division's annual research and development budget topped $100 million. [Ref. 44]

Northern Telecom and AT&T research and development expenditures during 1984 only hint at the magnitude of the total R&D efforts of the private sector. For example, MCI Communications Corporation spent over $20 million per week during 1984 in expanding its network using the latest in technology in an effort to gain a competitive edge over AT&T with the efficiencies of its modern network [Ref. 45]. The 1984 estimate for R&D expenditures at ITT was $1 billion [Ref. 41]. It is safe to conclude that survival in this competitive market hinges on keeping pace with the technology through large R&D budgets. This short term reality is somewhat opposed to what some analysts' long-term forecasts had predicted. As one study conducted for DCA in 1980 foresaw, the long-term effects would include an increase in competition for equipment manufacturers, however marginal consumer benefit would result due to higher equipment unit costs and relative normalization of equipment pricing structures. The study went on to forecast increases in intra- and interstate as well as local rates, heavy price increases

in Bell-provided business services, deceleration of technological growth due to decreased control over high-cost technology R&D and manufacture, a substantial overall inflationary pressure on the domestic telecommunications industry, and the deferment of technological innovation [Ref. 46: pp. 4-6]. The rush of competitors into the market has, for the short term at least, spurred rather than suppressed technological growth. It remains to be seen what the effects will be for the long term, after the major equipment market peaks in the 1987 time frame, as analysts currently predict.

2. Market Niches

In addition to the marriage of computer and telecommunications technologies, the forces of a competitive market are producing new technologies in segments or niches within the industry. Again, using 1984 as a base year, it can be seen that in the short run at least, competition is spurring a technological onslaught.

a. Voice Mail

The public voice mail niche saw three new entrants during the year. American Express Company, GTE Corporation and Voice Mail International Inc. introduced their entries into the market. Voice mail uses computers to record, store and forward voice messages either in conjunction with an office PBX for internal distribution or with a central computer accessed via the public switched network. [Ref. 47]

The spread of this new capability within the DOD has been rapid. For example, the Air Force Communications Command (AFCC) is currently using voice messaging service in its operations throughout the U.S., Europe and the Pacific basin. Overseas access to the service is via AUTOVON

connection to Carswell Air Force Base in Texas, where callers are patched through to the local commercial network for entry into the system. Similarly, the Joint Tactical Fusion Program Management Office is using voice messaging to maintain constant information flow between varied locations, regardless of time zone or personnel availability considerations. The cost savings resulting from elimination of written communications plus the remarkable increases in productivity realized by permitting communications 24 hours a day, seven days a week, irrespective of time and location, indicates that the demand for this service will expand within DOD. [Ref. 48]

b. Electronic Mail

AT&T joined MCI Communications Corporation and Western Union Corp. in the $100 million electronic mail (EMAIL) market. AT&T's entry into the market (a market which is growing at a 50 percent annual rate) will not only provide electronic mailbox services for personal computer access but will also permit message retrieval via the PSN. This service, known as AT&T Mail, will use computer-generated voices to read mailbox messages to users via their telephone. [Ref. 49]

The DOD is already heavily involved with electronic mail services. The Navy Research Laboratory (NRL) operates the Navy Electronic Mail Service (NEMS) which provides service to every NRL site. The Naval Data Automation Command (NAVDAC) manages the Naval Regional Data Automation Center (NARDAC) Network (NARDACNET) which is purchasing up to ninety-nine electronic mailservers to provide EMAIL support service. These electronic mailservers are expected to be on line by the end of 1985. Defense Data Network (DDN) electronic mail (DDNMail) mailservers (owned by DCA) are currently operating at maximum capacity and the

growth in demand is expected to far outstrip the network expansion.

These examples illustrate the widespread use of electronic mail within the DOD. This proliferation is remarkable since, as Rod Richardson (former DDN Project Management Office, Navy Systems Implementor) phrased it, "EMail is used by nearly every manager in DOD but there are no guidelines to govern its growth or use." He went on to say that EMail use "... is not even covered by DOD policy or guidance letter." [Ref. 50]

c. Video Teleconferencing

Technological advances enabled the production of new code compression (codec) devices (devices permitting the digital encoding and compression of TV signals) during the year. Windergren Communications Inc., of Campbell, Calif., began marketing these low-speed codecs in June, 1984. These new devices will enable video teleconferencing using moving color video over standard telephone lines at a drastically reduced rate of 56,000 bits per second (bps).[15] Illinois Bell Telephone Company began offering this low speed digital service in late 1984. [Ref. 51]

In December 1984, COMSAT General Corporation was awarded a $2.9 million contract for the design and fabrication of three full-motion color video teleconferencing systems to link the Naval Sea Systems Command Headquarters in Arlington, Va. with Naval Underwater Systems Center research laboratories in Newport, R.I. and New London, Ct. These systems are scheduled to be operational in mid-1985. The stated goals of using these three systems are: (1) more efficient and productive use of engineers and scientists by

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[15]Previous teleconferencing services used dedicated transmission lines with transmission rates of 1.54 million bps.

improving communications between dispersed groups working on common technical programs; (2) enhancement of management meetings and technical conferences through greater participation by employees unable to attend due to scheduling conflicts or travel limitations; and (3) reduction of manpower losses due to travel time and a significant cost savings in travel and associated expenses. [Ref. 52]

Again, the list can be continued with advances in fiber-optic technology fostering the growth of new market niches in transmission systems [Refs. 53,54], while telephone companies moved into the arena of cable television system installation and maintenance. [Ref. 55]

These examples serve to illustrate the changing face of the telecommunications industry. Due to the strong competitive currents in the industry it is anticipated that, at least in the near term, large research and development expenditures will continue to pave the way for industry expansion and growth along the frontiers of changing technology. As these new technologies emerge, it is anticipated that Navy and DOD expansion into these niches will continue.

C. MONETARY

The enthusiasm generated by the lure of new technology, as discussed in the preceding section, is quickly dampened by the reality of the monetary factors and budgetary constraints imposed upon NATS management options.

Traditionally, the COMNAVTELCOM budget has averaged approximately 4 percent of the total Navy budget. Since funding for NATS has been handled primarily under the Communications Services Industrial Fund (CSIF), the shift of NATS management responsibility to COMNAVTELCOM does not imply any major reallocation of financial resources within the Department of the Navy.

Even though the financing of NATS expenses through the CSIF tends to make its costs less visible, it is essential to understand the magnitude of the costs involved. For example, the combined DOD budget for fiscal year (FY) 1984 allocated $1.3 billion for combined local and long distance telephone expenses and an additional $2 billion for equipment purchases, support and related costs [Ref. 56]. The Navy's direct lease costs for equipment are approximately $125 million annually and the overall leased telecommunications services costs to the Navy are in the range of $250 million annually [Ref. 28]. These direct lease costs are expected to continue to escalate, although a respite was gained in June 1984 when the FCC declared a one-year moratorium on rate increases for AT&T-owned embedded equipment. The Commission was distraught over a steady stream of price hikes by AT&T Information Systems, the unregulated division who inherited the Bell System embedded equipment base after the divestiture [Ref. 38], and so, temporarily, halted further rate hikes.

The imposition of access charges in 1984 as part of the price restructuring effort within the industry have directly impacted NATS costs. The first of these monthly access charges, $6.00 per line, was levied against multiline business subscribers on 25 May. This same monthly charge was also applied to Centrex customers whose lines were ordered or installed after July 27, 1983, while Centrex customers who beat this deadline were assessed a reduced monthly charge of $2.00 per line. [Ref. 38]

The final fee levied by the FCC during 1984 was a $25.00 per line monthly surcharge for interstate private line users. This surcharge was directed at discouraging bypass. Bypass occurs where interstate private lines connected to PABXs are used to carry interstate calls, thus bypassing the local network on either or both ends of the termination. [Ref. 29]

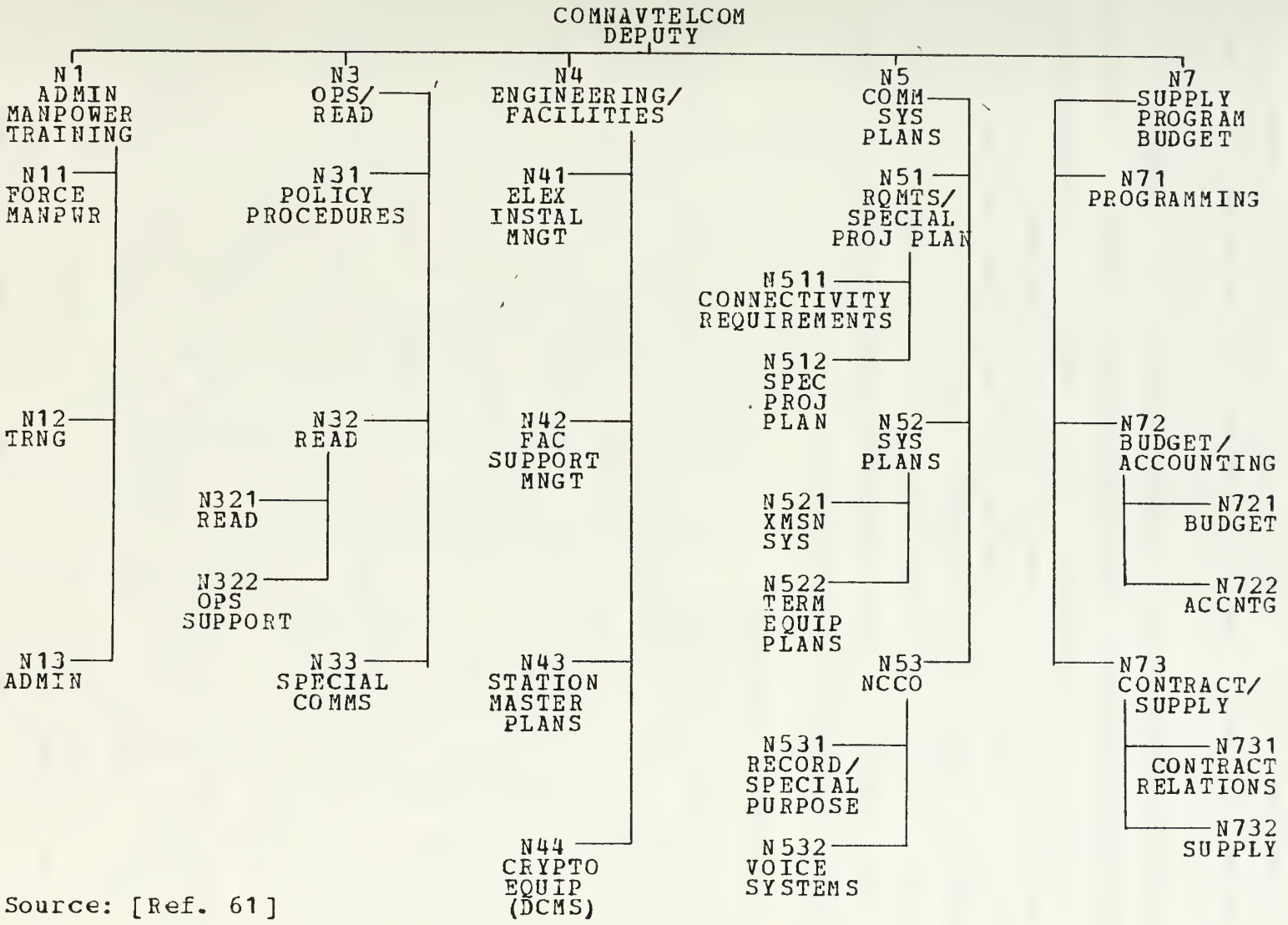
The rate structure fluctuations during 1984 were mixed. Although AT&T long distance rates dropped by 6.1 percent in May following an FCC order [Ref. 57], local service rates increased an average 24 percent nationwide on the year [Ref. 58].

Although AT&T long distance rates were lowered in May, many cheaper alternatives still exist to obtain long distance service. The list of AT&T competitors in the long distance market is growing and savings of 25 to 40 percent are possible using alternative SCC services. The overall quality of such services, although inferior initially, has steadily improved to the point that they provide high quality circuits for long distance service. [Ref. 59]

Overall, terminal equipment prices and long distance rates have declined while local rates and access fees have increased. This monetary turbulence further mandates an active management role if cost-effectiveness is to be achieved.

D. STRUCTURAL

COMNAVTELCOM Headquarters has recently undergone a reorganization. Under this new organizational structure (detailed in Figure 4.1) NATS management functions will fall within the Communications Systems Plans (N5) Directorate and be vested in the Navy Commercial Communications Office (N53) [Ref. 60]. The Navy Commercial Communications Office will operate through four field offices to provide NATS management support throughout the world. These field offices will be located in San Diego, Ca. (serving the Western U.S.); Norfolk, VA. (serving the Eastern U.S.); Pearl Harbor, Hi. (providing Pacific coverage); and Naples, Italy (servicing Europe) [Ref. 28].



Source: [Ref. 61]

Figure 4.1 Interim COMNAVTELCOM Headquarters Structure

At the Headquarters level, the Navy Commercial Communications Office will employ a total of twenty-two personnel with approximately 120 to 140 personnel staffing the field offices. This structure will allow the Navy Commercial Communications Office organization to support the overall communications systems planning function of the N5 Directorate and thus support the Commander in discharging the responsibilities for overall NATS management.

This structural variable is considered an external influence to the NATS management issue because this headquarters structure was formulated to meet the larger management requirements of the Naval Telecommunications System, COMNAVTELCOM's primary tasking.

E. INFORMATION SECURITY

Information security has become an ever-increasing concern within the Government and the DOD in recent years. It has become a very high visibility issue, due partly to general media coverage such as broadcasts on the CBS television network series "60 Minutes". Even the National Security Agency (NSA), normally reticent with regard to publicity, has been in the news because of its concern that electronic eavesdropping poses a severe threat to the security of the United States as a result of an increased usage of communications satellites and microwave transmission towers for the relay of telephone conversations.

In 1977 President Carter ordered an acceleration of telephone security programs for the government. The result of this order was the establishment of the Secure Telephone Unit (STU) Program. This program has evolved since 1977 into its current phase, the STU III, which is intended to equip both government and industry (defense contractors) with over 500,000 secure telephones. These telephones will

convert speech to digital form, encrypt the speech by the addition of a pseudorandom noise (PN) digital bit stream and transmit this encrypted signal over normal telephone lines using digital modulation.

Contracting for the manufacture of these telephones has begun and the initial production target for the first two years is 100,000 units. The objectives of the STU III Program are [Ref. 61]:

1. Volume production deliveries by 1987
2. Size to be that of a conventional office telephone desk set
3. High quality voice reproduction
4. Ease of installation using standard modular telephone company interfaces
5. Elimination of special secure storage requirements
6. Full duplex operation over a single telephone circuit
7. Multilevel security from unclassified to top secret (with positive authentication of the authorized clearance level)
8. A unit cost of $2,000 or less in production

It is still too early to tell if the program will meet all of these objectives, but they do serve to indicate the seriousness with which the information security issue is being pursued. Just as with the introduction of the new technologies previously presented, so too the introduction of an effective, affordable secure telephone will produce a sharp rise in demand for this capability. This presents an additional challenge for NATS management from an open system perspective, since Navy managers will demand this capability to reduce delays and increase efficiency in information transfer.

F. SYNOPSIS

This chapter has outlined the major environmental variables which are pertinent to an open system approach. In examining these variables, management complexities imposed by the regulatory, technological, monetary, structural, and information security issues become apparent.

The reign of AT&T over the telecommunications industry eliminated the need for NATS planning functions. Basically, AT&T dictated the introduction of new technologies, equipment and services tc the industry. The Navy, like other consumers, could only choose from among the options delineated by AT&T and thus, the need for planning was absent. Furthermore, AT&T provided installation and maintenance services, engineering and design functions and consulting services in recommending the proper mix of AT&T-provided hardware and services to meet NATS requirements. The regulated monopoly structure of the industry further reduced planning requirements by providing a stable economic environment which eased the burden of programming and budgeting for NATS. It is clear that the void created by the disappearance of AT&T as a focal point for industry coordination must be filled.

The forces of a competitive market structure have resulted in the introduction of new technologies, the merging of existing technologies, the emergence of dynamic pricing structures and the proliferation of equipment and service vendors. The increased awareness and concern over information security further complicates the scenario. These changes only serve to emphasize the need for planning, as well as indicate the necessity of control mechanisms for the constant reevaluation of shifts within the industry.

Dealing with a competitive industry will force changes in contracting and procurement efforts as well. To

adequately and efficiently deal with multiple vendors, systems analysis and design functions will be required. NATS node traffic flow and support requirements must be analyzed in order to develop specifications for system requirements which form the basis of performance work statements in solicitations to industry. System evaluation criteria are required in order to develop mechanisms to evaluate technical responses to these solicitations. [Ref. 28]

The complexities introduced by these external variables complicate NATS management requirements. The open system approach, by incorporating this complexity, will also require an increasingly complex management strategy to effectively deal with the interaction.

V. CLOSED SYSTEM STRATEGY

The closed system approach views only those factors internal to the organization. The chunking of the NATS management problem and the coordination mechanisms employed for combining these chunks are then determined by these internal factors (as presented in Chapter III).

A. PROCEDURE SPECIFICATIONS

The overall hybrid strategy concept is focused upon centralized support for decentralized decision making. The centralized functions are to be focused within the COMNAVTELCOM Headquarters level as depicted in the Interim Organizational Listing presented in Figure 4.1. The four field offices of the Navy Commercial Communications Office are considered part of the Headquarters level for discussion purposes. It should be noted, however, that this hybrid strategy does not necessitate a field office concept. All centralized functions could be performed at the Headquarters by consolidating personnel if that option proves less costly. The decentralized decision making is to occur at the local NATS node unless otherwise indicated.

1. Node Analysis

Satisfaction of the requisite level of administrative telephone support at the installation is a function of the identification of local requirements. Since requirements vary from installation to installation, node analysis emerges as the single most important function at the node. With the primary purpose of NATS as providing a support function at the local installation, the NATS node manager

should serve in the administrative staff of the installation or base commander. In this capacity, the node manager can serve in an advisory role to the local commander and act as a central point of contact for local user requests. The service and hardware acquisition procedures detailed later will amplify the need for this administrative staff status. Since user requests are centered on terminal equipment and installation wiring needs, the node manager can consolidate requirements for forwarding to the headquarters level.

The second major function of node analysis is the determination of traffic flow. The collection of data on traffic flow statistics, such as call origin, destination, duration, time of day, etc. is vital to engineering and design, as well as, service and equipment contracting functions. Traffic flow analysis will supply the data base to support these functions.

The level of effort required for node analysis will be a function of installation size. For major installations, workload requirements will dictate a full-time NATS manager. Traffic analysis efforts will require the use of either call logging capabilities inherent to the switchboard or the addition of separate call monitoring equipment currently on the market.[16] For minor installations, workloads permit collateral-duty NATS managers and traffic analysis functions to be conducted via user-maintained terminal equipment logs or from itemized listings provided with billings.

Traffic flow data coupled with local NATS plant drawings and plans detailing the specifications and locations of all terminals and central equipment (switchboards or PBXs for major installations and terminal blocks for minor installations) along with cable-plant/installation

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[16]A discussion of some of the systems available for sale or lease can be found in Reference 20: pp. 101-103.

wiring diagrams form the data base for NATS management. Most of the plant data required can be obtained from the mechanized management information system maintained by NAVFAC's Facilities Support Office at Port Hueneme, California [Ref. 14: p. D-14].

Once these data bases are established by each NATS node, the information must be forwarded to the headquarters level so that it is available as a management tool both locally and centrally.

2. Engineering and Design

Engineering and design functions are beyond the capabilities of the local installation. For this reason, these functions should be centrally supported. Due to the long operational life of major equipment (as evidenced by the average age of hardware currently in use) and the relatively small number of major NATS installations, the engineering and design functions are conducted by a headquarters level engineering and design team comprised of members of the Navy Commercial Communications Office with engineering support from the Naval Electronics Systems Command (NAVELEX) and NAVFAC. A similar process is currently used for the NTS, whereby a Base Electronic System Engineering Plan (BESEP) is prepared by NAVELEX Field Technical Authorities in concert with NAVFAC Engineering Field Divisions [Ref. 1: encl (1) p. 3, encl (7) pp. 1-2].

During on-site visits the team would coordinate with the local manager and use the node data base and other information gathered on-site to determine system and hardware specifications. Returning to headquarters, the team would use the information obtained from the site visit to determine specific hardware requirements and to conduct lease versus buy analysis in accordance with standard procedures (OMB Circulars A-76 and A-94). This lease vs. buy

analysis would determine the most economic approach for major hardware acquisition and would also develop sufficient data for the formulation of the performance work statement and technical evaluation plan necessary for competitive equipment procurement through solicitations for contractor bids.

3. Installation and Maintenance

The regional contract approach adopted for the NATS transition would be retained under this hybrid strategy. For major installations or installations grouped in a geographic area, single contracts can be used. For minor installations, area contracts awarded either by state, Naval Recruiting Command Areas (8), or Naval Recruiting Command Districts (52) will be used. [Ref. 28]

The contract strategy employed would depend on responses to solicitations. As installation and maintenance is a new market niche, the contract approach must be modified as necessary to follow market development. The contract scope of work definition and technical evaluation package would be developed at the headquarters level, again using the node data bases and relying upon standardized performance work statements tailored to each regional or local contract.

4. Programming and Budgeting

The programming and budgeting effort can be totally decentralized with the exception of management overhead costs at the headquarters level. For telephone services, minor equipment, and installation and maintenance costs, normal installation Planning, Programming and Budgeting (PPBS) procedures for Operations and Maintenance (O&M) funds will be followed. Cost data for installation and maintenance will be provided by headquarters and DECCO based upon the contract costs.

For major equipment purchases, cost data derived from the engineering and design procedure will be used for Other Procurement, Navy (OPN) budget submissions.

The reimbursement of the CSIF from O&M funds will be accomplished on a monthly basis by the Authorization Accounting Activity (AAA) servicing the installation or O&M Expense Operating Budget (EOB) holder. Although representing an increased accounting and reporting burden over present procedures, the advantages overcome this added burden. If the reimbursement is accomplished centrally the costs tend to be transparent to the local consumer. This lack of a user cost incentive contributes to overconsumption. By using local reimbursement procedures, whereby programmed O&M funds are allocated to the consumer's budget, the cost incentive is reintroduced and excess consumption eliminated. This method forces efficient, cost-effective resource utilization.

5. Service Acquisition

NATS long distance services should be centrally contracted by DECCO. Standing contracts should be awarded for both local and SCC services. At the NATS node, the traditional CSA method will be employed to incur obligations against these standing contracts.

In selecting the mix of SCC services required, a least-cost approach, such as that formulated by Scott Klingler [Ref. 62], should be used. Similar methods are also currently available from the private sector as well [Ref. 63]. For installations with access to adequate computer facilities, the analysis can be conducted on-site. If no computer facilities are available locally, support should be provided by the headquarters level.

This least-cost approach uses current rate tables of the long distance carriers to determine the lowest cost

alternative, based upon node traffic flow data for a three-month period. This computer analysis coupled with estimation techniques such as those described by Klingler [Ref. 62: pp. 63-65], will provide the NATS node manager with the information required to choose the least-cost alternative for SCC service. The full implementation of equal access will further simplify the analysis process by eliminating the need for dedicated leased access trunks [Ref. 64: p. 22].

To support this procedure, the headquarters level must maintain current rate tables for SCC offerings and provide computer support for the analysis. For installations with access to local computer facilities, rate table data should be provided by the headquarters level while installations without such computer access must forward current traffic flow data (in machine readable format) to the headquarters for analysis. Annual review requirements for the analysis will ensure that local SCC service choices remain least-cost choices. Such methods are considered to be within the capabilities of local NATS management personnel if adequate central support is available. As example, more complex economic analysis techniques than these are currently supplied for use in ADP applications [Ref. 65].

6. Equipment Acquisition

Contracts for the lease or purchase of major equipment will be centralized under DECCO. These contracts will be competitively awarded based upon specifications and evaluation criteria established by the headquarters level during the engineering and design procedure. Again, these contracts should be financed by CSIF funds for lease agreements with reimbursement by the NATS node using O&M funds. For major equipment purchases, activities will submit a

Military Interservice Procurement Request (MIPR) to DECCO. DECCO should then competitively award the contract citing the activity's O&M or OPN funds, as appropriate.

B. SYNOPSIS

The development of the hybrid strategy was based upon certain assumptions regarding policy requirements and planning objectives which are considered generic and not strategy-specific. The procedures developed to accomplish the objectives for the hybrid strategy center upon the concept of centralized support for decentralized decision making. The key tocl used in these procedures is the NATS node data base which is developed during node analysis. This data base is an input to other procedures and thus the node manager must ensure that the data base is current and accurate.

Cost-effectiveness is achieved with the hybrid approach by requiring economic analysis for lease vs. buy decisions for both major equipment, service and terminal equipment acquisition. Competitively awarding contracts furthers this objective and the use of the CSIF and MIPR procedures with local C&M/OPN reimbursement focuses NATS costs at the local user level. The local programming and budgeting of funds for NATS requirements overcomes the hidden communications cost problem associated with CSIF funding. By forcing NATS users to consider the cost of administrative telephone services, the requirements for such services will be examined more thoroughly and the uncontrolled growth of requirements will be checked.

The programming and budgeting approach requires no major modifications to the Navy Planning, Programming and Budgeting System. The O&M allocation procedures must be modified to permit funds to flow to the EOB holder instead

of being allocated to a central authority, as is currently the case with funds for leased NTS requirements being allocated to COMNAVTELCOM [Ref. 1: encl (3)]. The accounting systems already in place at the AAAs are considered adequate to accommodate the reimbursement of the CSIF by O&M funds from EOB holders. Programming and budgeting for major equipment purchases via OPN funds represent little change from current procedures.

The hybrid approach is not personnel intensive. The NATS managers currently in place at the nodes can handle the increased duties of the hybrid strategy if adequate headquarters level support is provided. The 140-160 personnel envisioned for the Navy Commercial Communications Office organization are considered sufficient to handle centralized functions if engineering support is obtained from NAVFAC and NAVELEX.

Finally, the reliance upon DECCO for centralized contracting functions minimizes personnel requirements at the headquarters level. The additional benefits to be derived from this centralized purchasing concept include: (1) the minimization of duplication of effort and differing purchasing practices; (2) increased efficiency due to quantity discounts, purchasing specialization and reduced record keeping requirements; and (3) economies of scale in that maximum competitive advantage results from the greater economic purchasing power achieved by centralization. [Ref. 13: pp. 54-55]

VI. OPEN SYSTEM APPROACH

A. POLICY ISSUES

As the Chief of Naval Operations stated in the 1980 OPNAV Instruction which governs Naval Telecommunications System operating requirements [Ref. 1: p. 2]:

> "The increasing high costs of telecommunications support, especially leased services, have resulted in high visibility of communications programs at all levels of government. This fact underscores the need for management awareness and improved life cycle documentation of telecommunications resources.
>
> Development and planning for a responsive Naval Telecommunications System requires early identification and consideration of user requirements so that requisite programming to obtain necessary resources can be accomplished. The recognition, definition and submission of telecommunications requirements ... will permit system planning and programming to acquire necessary resources."

Although the statement was focused upon the Naval Telecommunications System, the concepts expressed are directly applicable to the Naval Administrative Telephone System as well. Divestiture and the resultant competitive turbulence have spurred a heightened visibility of communications programs since this 1980 instruction was issued.

Efforts to deal with unrest in the telecommunications arena are ongoing. The January 29, 1985 reorganization within the Office of the Secretary of Defense serves as an example of this continuing effort. The reorganization resulted in, among other things, the consolidation of all DOD command, control, communications and intelligence (C^3I) functions under an Assistant Secretary of Defense for C^3I. As Secretary Weinberger stated, the consolidation of C^3I functions was "... to insure consistency of DOD policy development, resource management and program evaluation

...." In a DOD Memorandum to the services, Weinberger explained the concept further, "... it is important that there should be a central management mechanism for the review of DOD wide C³I issues to establish priorities, make the trade offs that are essential for cost effective program balance and make effective decisions and recommendations ...." [Ref. 66]

This DOD staff reorganization is a structural approach to cope with the increased complexities of telecommunications management and the increasing visibility of DOD resource allocation and utilization. Increased complexity and visibility considerations raise certain issues to the forefront. The merger of computer and telephone technologies with the implicit assumption of economies of scope to be realized by the utilization of shared resources (i.e., PBXs and telephone wiring) coupled with the need for NATS plant modernization indicates a requirement for Navy telecommunications policy review. It is estimated that 85 percent of all teleprocessing[17] requirements are local, i.e. within twenty-five miles [Ref. 67: p. 81]. The issue of long distance teleprocessing has been resolved by mandating Navy-wide use of the DDN [Ref. 68], however, the local issue still exists. As Navy managers continue to require increased teleprocessing support, the number of teleprocessing systems is expected to increase rapidly [Ref. 67: p. 78]. This rapid expansion of teleprocessing requirements, together with the merger of technologies and the NATS modernization requirement mandate the need for a base-line review of Naval telecommunications policy.

At the present time administrative telephone systems are excluded from those policies governing automatic data processing (ADP) and other communications requirements.

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[17]Teleprocessing is a form of information handling in which data processing systems use communications facilities.

This chunking of ADP responsibilities to COMNAVDAC and NTS and NATS responsibilities to COMNAVTELCOM precludes COMNAVTELCOM from affecting the coordination necessary to achieve the cost benefits of shared resources to be achieved through modern technology. Furthermore, the tendency has been to view ADP from a 1960s computer technology focus, when processing capability was centered in large, expensive mainframe computer systems and economies of scale dictated ADP resource centralization. In today's computer technology of distributed data bases, LANs and mini- and microcomputers, as much (or more) processing capability can be achieved at far less cost using PBX-based LANs.

These issues are not unique to the Department of the Navy; similar factors are confronting all the services. From an open system perspective, both internal and environmental variables must be considered in resolving these issues. The U.S. Army and U.S. Air Force have already proceeded with actions aimed at resolving the problem.

The Army's action commenced in 1984 with the announcement of the establishment of a staff agency and a major command to coordinate the modernization of information management, communications, and command and control systems. The establishment of the Office of the Assistant Chief of Staff, Information Management (OACSIM) was completed in late July. This staff agency is to formulate the policy to enable the integration of all information resource management, automation, administration, communications, and command and control. The major command (which will be fully operational by the end of FY 85) is the U.S. Army Information System Command (USAISC). The USAISC is being formed by merging the Army Communications Command and the Army Computer Systems Command. This action being taken by the Army is in response to the need to ensure that money is being spent on automation, communications, information

management and command and control systems that are mutually compatible. [Ref. 69]

The Air Force has adopted a similar approach. In 1983 the position of Assistant Chief of Staff, Information Systems (AF/SI) was created at the Headquarters, U.S. Air Force. AF/SI commenced developing organizational models merging communications and data automation functions at all levels throughout the Air Force. The Air Force Communications Command was identified as the logical choice to manage these merged functions. Under the model, the AFCC would implement, operate and maintain each major Air Force Command's information system under the direct operational control of the host commands. In late 1984 the first of these planned mergers occurred when the Strategic Air Command (SAC) data and office automation functions and resources were combined with the telecommunications resources of the AFCC [Refs. 70,71]. This U.S. Air Force effort represents another example of the requirement to face the complex issues of information transfer with pronounced organizational thrusts.

As stated in Reference 1, "The basic telecommunications requirement is the need to transfer information, which in turn is translated into specific circuit requirements." This need to transfer information, whether it be by voice, record message traffic, computers, electronic mail, etc., should be governed by a single policy; otherwise, fragmentation results and conflicting requirements for thresholds, submission procedures, etc. (such as those identified in Reference 72) can occur. Without a dynamic coordinating mechanism, the overall effort can only be inefficient.

The lack of a single policy within the Department of the Navy for information systems reinforces a closed system view by continuing former work breakdown patterns. This has produced fragmentation and duplication of effort and the

hierarchical overlay used for this breakdown precludes effective coordination at the second and third echelon command level. For example, both ADP and NATS support levels are established as a function of local requirements. Although these requirements coexist at the local level, requests to fulfill them are currently submitted through separate administrative chains to third and second echelon commands. These requests are then forwarded through separate divisions in the OPNAV staff, to eventually merge again at the OP-094 level. Such an organizational overlay precludes addressing issues such as economies of scope to be realized through shared resources since, under current policy, the necessary formal authority does not exist at intermediate levels.

The need for an open system approach is evident. The Army and Air Force have met this challenge with sweeping reorganizations. However, the existence of a professional corps of communications personnel within these services has certainly influenced these organizational reactions. The need for such an organizational approach within the Navy is not immediately obvious. However, it is obvious that an open system approach is needed.

VII. CONCLUSION

The transfer of management responsibility for the Navy's administrative telephones to the Commander, Naval Telecommunications Command can be viewed as an organizational attempt at meeting the complex challenges presented by fundamental structural changes within the telecommunications industry. The dichotomy of the closed system and open system approaches to organizational development and management theory is a useful tool in analyzing these complex challenges. Although the demarcation lines between these two approaches become nebulous at times, they prove useful in modeling the pre-divestiture and post-divestiture management requirements for the Navy's administrative telephones.

Prior to the breakup of the Bell System and increasing competitive forces within the telecommunications industry, the closed system approach proved adequate for managing the NATS. With the external environment stable, management efforts could be focused upon internal factors. AT&T, as the industry monopolist, was functioning, in effect, in a pseudo-management capacity for the NATS. With the breakup of the Bell System, AT&T could no longer function in this capacity. The advent of strong competitive forces within the industry quickly spurred technological innovation and an acceleration of market turbulence. The proliferation of equipment and service vendors complicated purchasing strategies. The merger of computer and telephone technologies coupled with the rapid increase in demand for voice and electronic mail services, video teleconferencing and other competition-spawned services further complicates the NATS management task. The conclusion is that an open system approach is required for NATS management. This need to

interact with the environmental factors is exemplified by the management strategies adopted by the Army and Air Force in integrating all information transfer functions under one central management structure. With this approach, cost-effectiveness is achieved by maximizing the benefits of the economies of scope to be realized through shared resources.

It is evident that any fundamental change in overall management policy will require time to analyze and implement. Therefore, COMNAVTELCOM must assume a closed system approach for NATS management until such time as fundamental policy shifts may be accomplished.

A closed system management strategy must, at a minimum, fulfill traditional management responsibilities while at the same time fill the void created by the removal of AT&T as the industry monopolist. Toward this end, a closed system management strategy was posed in Chapter V, and procedures were presented to meet these traditional and new management responsibilities from a cost-effective standpoint. The final selection among all the strategic alternatives must be made, however, from an analysis of the cost-effectiveness of each alternative.

This closed system approach is viewed as, at best, a short term solution. The volatility of the telecommunications environment dictates an open system approach based upon a solid analysis of overall telecommunications requirements, both present and future, within the Department of the Navy. For this approach to be effective, two conditions are necessary. These two conditions were summarized by Peter Drucker, noted author and management theorist, as: "... knowledge by the entire organization of what the direction, the goals, the expectations are; and knowledge by top management as to what the decisions, commitments and efforts of the people in the organization are. The needed focus - one might call it a 'model of the relevants in internal and

external environment' - only a 'long-range plan' can provide" [Ref. 73: p. 136]. But, for a long range plan to succeed, a coherent organizational overlay must exist to implement and monitor the plan. For long range planning is, as Drucker defined it, "... the continuous process of making present 'entrepreneurial (risk-taking) decisions' systematically and with the best possible knowledge of their futurity, organizing systematically the efforts needed to carry out these decisions, and measuring the results of these decisions against the expectations through 'organized, systematic feedback'" [Ref. 73: pp. 132-133].

To accomplish this task, three steps emerge as important. First, the development of a short term management strategy is recommended for NATS. A least-cost approach is indicated in the formulation of this strategy.

The second recommendation is that a base-line review of the Navy's information transfer requirements be conducted. This review should assess these requirements in light of current and projected technological advances.

The third and final recommendation is that this baseline requirements review be used as the foundation for an analysis of the organizational structure required to meet the management challenges of information transfer within the Navy. The decision to retain current hierarchical structures or to formulate new functionally-oriented organizational units must be made upon this objective analysis if the Navy is to be assured of achieving an optimal balance of requirements and economy.

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